

HIGH RESOLUTION DYNAMICS LIMB SOUNDER

Originator: Brock Carpenter

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Subject/Title: **States & Modes Definitions**

Description/Summary/Contents:

1. This TC presents definitions of States, Submodes, and Modes to support Mode requirements statements in the ITS.

Keywords: states, modes, submodes, transition, ITS

Purpose of this Document:
(20 char max.)

Reviewed/Approved by:	Wayne Rudolf	Jerry Drake	Eric Johnson
Date (yy-mm-dd):			

**Advanced Technology Center, CAGE Code 65113
Lockheed Martin Missiles & Space
3251 Hanover Street
Palo Alto, CA 94304-1191
United States of America**

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Background:

A meeting was held at Lockheed Martin on Dec. 19th with Eric Johnson, Brock Carpenter, Jerry Drake, Ron Baraze, and Dipa Suri. This meeting was held to achieve a common understanding of Modes and States and their interrelationships when considering the Instrument and its Subsystems, especially the IPU and the corresponding documentation in the Command and Telemetry Handbook.

The following definitions and diagrams are presented for clarification of the Modes requirements in the ITS. Mode requirements cannot be defined unless a common set of nomenclature is used by all HIRDLS personnel. Note that Table 1 and Figure 1 are illustrative (i.e., not HIRDLS) of an Instrument on a Spacecraft with 9 Subsystems where each Subsystem is either on (1) or off (0). The shaded cells in the table indicate common “on” states for Subsystems in all Submodes of a Mode.

Table 1 — Example Modes, Submodes, and States (tabular)

Instr. Mode	Instr. Sub-mode	S/C State	S/S 1 State	S/S 2 State	S/S 3 State	S/S 4 State	S/S 5 State	S/S 6 State	S/S 7 State	S/S 8 State	S/S 9 State
A	A1	1	0	1	0	0	0	0	0	0	0
	A2	1	0	0	0	0	0	0	0	0	0
	A3	1	1	0	1	0	0	0	0	0	0
B	B1	0	1	1	1	1	0	0	0	0	1
	B2	0	1	1	1	1	0	0	0	1	1
C	C1	1	1	1	1	1	1	1	0	0	1
	C2	1	1	1	1	1	1	1	0	1	1
D		1	1	1	1	1	1	1	1	1	1

Table 1 and Figure 1 are included here to illustrate the definitions and relationships between Modes, Submodes, and States. Figure 1 is the graphical representation of the three permissible/required Instrument Submodes in the “A” Instrument Mode and the corresponding Subsystem States within each of the A1, A2, and A3 Submodes. In this example each Subsystem is only permitted to be in the 0 or 1 State.

From these diagrams it can be seen a Mode is a collection of Instrument Submodes wherein “most” of the Subsystem states are the same. Submodes are grouped into Modes for the purpose of simplifying the operational description of the Instrument to those outside of the HIRDLS Instrument Program, e.g. the Spacecraft Contractor. Submodes are stable conditions of the Instrument, e.g. OFF Submode. In the case where there is only one set of stable subsystem states within a Mode, it is possible that there is no Submode, only a simple Mode, e.g. Mode “D” above. THE SUBSYSTEMS DO NOT HAVE MODES, they have States. States are stable conditions of the Subsystems. Each Subsystem shall have only ONE State within a defined Instrument Submode. On the other hand, a Subsystem may have different or identical States between Submodes within a Mode.

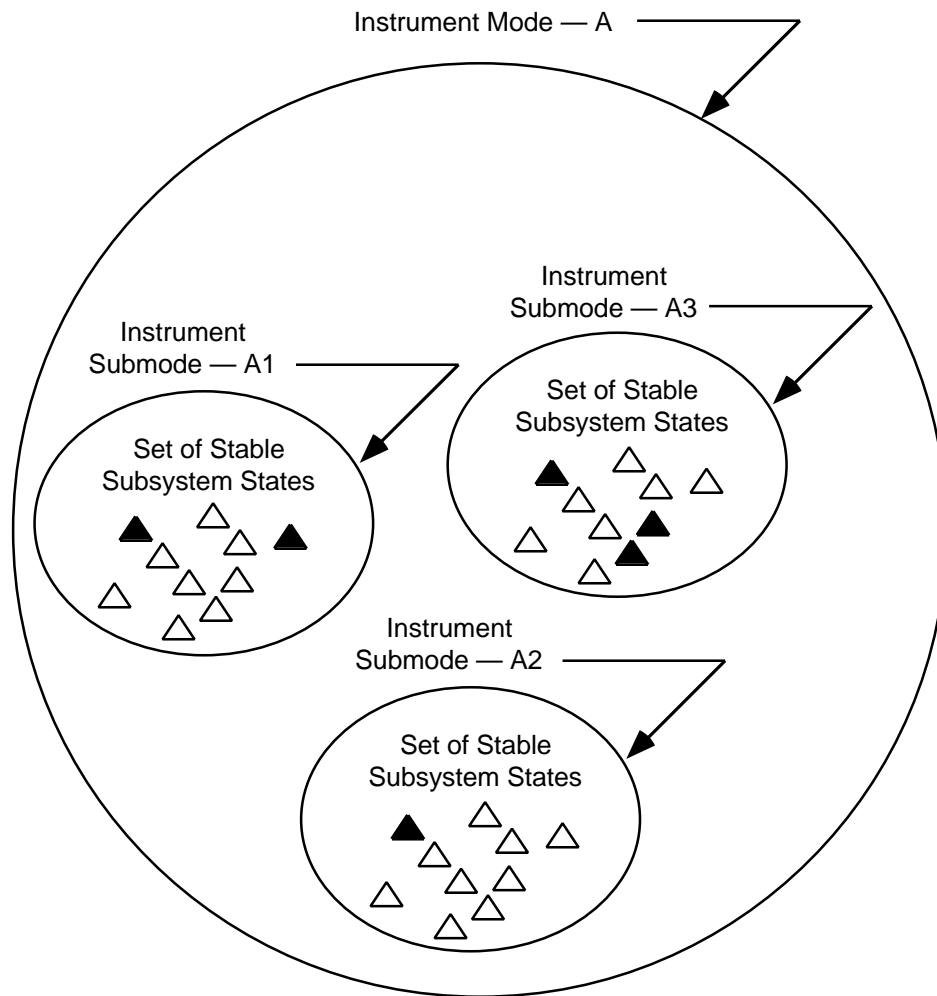


Figure 1 — Example Modes, Submodes, and States (graphical)

To further clarify, a Stable Subsystem is one in which all parameters are nearly constant (e.g. the Blackbody being maintained at XXX K). For the purposes of these modes requirements, the TSS is considered Stable when it is performing a repetitive scan pattern.

There are times when Subsystems are not stable, e.g. DSS cool down. This is defined as a Transition between stable states.

One SHALL NOT use the same name for states, submodes, and modes. Experience shows that using the same name for an Instrument Mode, Instrument Submode, and/or Subsystem State leads to confusion and rework. This confusion comes from the tendency to assume, when the Instrument for example is in the “Low-Power” Mode, a given Subsystem will always be in its “Low-Power” State. Furthermore, it also leads to the potentially false assumption that if a Subsystem were in its “Low-Power” State, that the Instrument will always be in the “Low-Power” Mode. When in fact, the “Low-Power” State of a Subsystem may apply to many of the Instrument Modes. Therefore, Subsystems States and Submodes shall NOT have identifiers that are identical to the Instrument Mode Names, and Subsystems are further restricted to NOT use State identifiers that are identical to Submode names.